

**STORMWATER CONVEYANCE  
AND  
DRAINAGE PONDS**

**OPERATION & MAINTENANCE  
MANUAL**

**Sandy Ridge P.U.D.**

CLC #S010421

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By  
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# **STORMWATER CONVEYANCE AND DRAINAGE PONDS**

## **OPERATION & MAINTENANCE MANUAL**

### **1.00 PURPOSE**

This document is intended to provide general operations and maintenance guidelines for the drainage conveyance systems, ponds and other drainage facilities located within the Sandy Ridge P.U.D. plat (County #PE-1757-94). Implementation of these guidelines will insure that the drainage facilities installed will function as intended in the design.

### **2.00 INTRODUCTION**

Generally, the drainage system is intended to collect upgradient stormwater runoff and convey it through the development to storage ponds. The drainage facilities consist primarily of a series of onsite drainage structures, storm pipes, treatment/storage ponds, and infiltration structures. It is of the utmost importance to provide adequate operations and maintenance activities to insure that the drainage facilities remain silt or dirt free, as this silt or dirt loading will affect the performance of the storm pipes, ponds and infiltration structures. If these facilities were to become completely clogged, the only remedy would be complete reconstruction the drainage facilities. Therefore, periodic maintenance is a must. A full set of engineering drawings is available for review at Spokane County Public Works. A site layout exhibit is provided in the Appendix of this document.

### **3.00 GENERAL OPERATIONAL CHARACTERISTICS**

The drainage facilities for Sandy Ridge P.U.D. are generally very simple, functional, and have low maintenance requirements. A periodic visual inspection of the facilities will identify most required maintenance. Most maintenance will consist of keeping the pipes, structures and ponds free of debris and sediment. A specific inspection schedule should be followed. See Section 4.0 for recommended maintenance schedules.

#### **3.10 Drainage Structures and Storm Pipes**

The onsite drainage conveyance system includes concrete gutters, curb inlets, concrete inlets, and 12" PVC storm pipe. Concrete gutters convey the onsite runoff collected in the streets to the treatment/storage pond, located in Tract A. An overflow for pass through volumes is also provided.

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#### 3.20 Drainage Ponds

The pond used in the design of the Sandy Ridge P.U.D. plat provides storage for the stormwater runoff created by the development. The storage volume for the pond was designed to adequately contain the runoff created 50-year storm event within the drainage basin it serves.

The pond is enclosed within earthen berms. The provided pond volume is based on the level portion of the floor of the swale and the sideslopes up to the outlet or overflow elevation. The soil located in the floor of the swale shall be a medium to well draining material, with a minimum infiltration rate of 0.5 inches per hour.

Pond specifications are provided in Table 3.20A. Additional information is provided in the engineering drawings on file at Spokane County Public Works, file PE-1757-94.

Table 3.20A - Pond Specifications

<b>Pond Label</b>	<b>Pond Btm. Elev.</b>	<b>Pond Btm. Area(SF)</b>	<b>Treatment Volume(CF)</b>	<b>Outlet Elev.</b>	<b>Berm Elev.</b>
A	2095.00	1,546	1,036	2095.67	2097.00

#### 3.30 Infiltration Structures

Pond A drains through an overflow structure to one double-depth (Spokane County Standard Type B) drywell that is used to infiltrate stormwater runoff beyond the required treatment volume. A copy of the Spokane County Standard Plan B-1a *Precast Drywells Placed in Swales* is provided in the Appendix for reference. These structures consist of a grated inlet, perforated concrete barrel sections, and buried washed drain rock, wrapped in porous filter fabric. The grate inlet elevation is set eight inches above the swale bottom to provide water quality treatment and a stilling basin below the overflow elevation of the inlet. The barrel sections and washed drain rock provide additional storage during infiltration.

### **4.00 MAINTENANCE REQUIREMENTS AND SCHEDULES**

Below is a maintenance description for each of the drainage system elements contained within the Sandy Ridge P.U.D. plat, including the drainage structures, pipes, grate inlets and the pond. All drainage facilities located outside of the County road right-of-way, are expected to be maintained by the Homeowners Association. Should the

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Homeowners Association be terminated for any reason, the maintenance responsibilities will become that of the individual homeowners, located within the Sandy Ridge P.U.D. plat.

The Homeowners Association shall provide to the Spokane County Parks Department and the Spokane County Engineer the name, address, and 24-hour telephone number for the entity responsible for performing routine and emergency maintenance inspections and repairs. This information shall be confirmed on a yearly basis. The Homeowners Association shall provide notice of any changes to the Spokane County Parks Department and the Spokane County Engineer within 15 days of said changes.

### General

Proper maintenance procedures are necessary for the continued functioning of the drainage facilities. Improper maintenance, or lack of attentive maintenance measures, may result in negative drainage impacts. It is strongly recommended that the Homeowners Association designate an individual who will be responsible for making sure the maintenance measures are implemented.

Generally, maintenance personnel are to conduct a visual inspection of the drainage facilities immediately following a substantial rainfall event or snowmelt event. Substantial events include:

- < Noticeably hard rain for a short period (30 minutes or more), or
- < Steady rain for a long period (6 hours or more), or
- < Significant rainfall and/or snowmelt when the ground is frozen.

For long duration storms, longer than 24 hours, maintenance personnel are to inspect the drainage facilities during the storm event to identify any developing problems and correct them before they become major problems.

1. Inspect all roadside ditches and drainage structures (grate inlets and drywells) to ensure they are clear of debris and obstructions.
2. Inspect all pond berms and/or retaining walls for breaches. Immediately repair any berm breaches with native sandy soil, compacted in place.

The above noted storm related visual inspections are in addition to the maintenance schedules noted below for each item.

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#### 4.10 Drainage Structures and Storm Pipes

Catch basins and pipes should be inspected every 3 months, or after every significant storm event ( $\frac{1}{2}$ " ) and/or snowmelt event, whichever is more frequent. Visually inspect the pipes, inlets and outlets, making sure they are clear of debris and checking that the pipe is in good condition, without breaks or cracks. If there is any obstruction present it should be removed immediately.

A flow test in the pipe can be used to readily detect major obstructions or breaks in the pipe. This test requires a water source (hydrant or water truck) and a person at the downstream end of the pipe observing the flow exiting out of the pipe section.

All catch basins should be cleaned (vacuumed) every 3 months.

#### 4.20 Drainage Ponds

The drainage ponds should be inspected every 3 months, or after every significant rainfall and/or snowmelt event, whichever is more frequent. The ponds consist of earthen depressions constructed from native soils, enclosed within soil berms and/or block retaining walls. At a minimum, each pond should be sodded and/or hydro-seeded with a dryland grass mixture. A lawn sod can be used if regular irrigating is implemented.

Routine maintenance and inspections of the pond will include removal of any accumulated debris such as leaves, weeds and trash. Any obstructions that would not allow water to flow freely from the ponds via the outlet structures should be removed or repaired. Additionally, the berms of the pond should be inspected to insure that they are in good repair and structurally competent and that no outflow has occurred other than through the outlet structures.

The Homeowners Association shall be responsible for replacement of any grass turf and underlying 1-foot depth of soil in ponds whenever the vegetation appears to indicate a problem due to contamination. The turf and underlying soil shall meet Spokane County requirements for permeability and cation exchange capacity/organic content in effect at the time of replacement.

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### 4.30 Infiltration Structures

The infiltration structures should be inspected every 3 months, or after every significant rainfall and/or snowmelt event, whichever is more frequent. These structures consist of a grated inlet, perforated concrete barrel sections, and buried washed drain rock, wrapped in porous filter fabric.

During routine inspection, if standing water is found 72 hours or more after the last significant rainfall event, the infiltration structure is most likely clogged due to silt and sediment. The structure shall be vacuumed to remove standing water and sediment.

### 5.00 **Recommended Set-Aside Funds for Maintenance & Future Replacement Costs**

Anticipated annual maintenance costs, major renovation costs and future replacement costs of the drainage facilities are listed in Table 5.00A below. These costs are the responsibility of the Homeowners Association or successors in interest. Major renovation and future replacement costs have been converted to annual costs, in the form of recommended set-aside funds. It is assumed that 1/2 of the pipe and one drywell will need to be replaced within 20 years.

Table 5.00A - Pipe Replacement

Pipe Size	1/2 Total Length (ft.)	Present	Value	Annual Set-Aside Cost <sup>(1)</sup>
		Per L.F.	Total	
12" PVC	318	\$ 18.00	\$ 5724	\$ 421
			<b>TOTAL</b>	\$ 421

The estimated annual maintenance costs and recommended annual set-aside costs are listed below in Table 5.00B. It is recommended the homeowner's association set-aside these amount of funds annually, to ensure that adequate maintenance and replacement measures of the drainage facilities will be implemented.

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Table 5.00B - Maintenance and Future Replacement Costs

Drainage Facility	Annual Maintenance Costs	Annual Set-Aside Funds for Future Replacement or Major Renovation <sup>(1)</sup>
Onsite Pipes & Drainage Structures	\$ 200	\$15
Drywells - Spokane County Type B	\$ 300	\$ 22
<b>Sub-total Annual Costs</b>	<b>\$500</b>	<b>\$37</b>

Note: (1) Assume replacement in 20 yrs, with 4% inflation and a 6% rate of return on investments for set-aside account.

**Grand Total/year = \$ 458**  
**Cost per lot/year = \$ 35 (13 lots)**

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**TECHNICAL APPENDIX**

**SITE MAP**

**PRECAST DRYWELL**

UNPLATTED

FLAT BOUNDARY

SANDY RIDGE

3 ②

2

1

3

2

1

1

2

3

1

2

3

1

2

3

4

5

6

7

7

ELTON LANE

EXISTING GRAVEL ROAD

NORTHWOOD THIRD ADDITION

SANDY RIDGE

①

2

1

1

2

3

1

2

3

1

2

3

4

5

6

7

20' DRAINAGE AND UTILITY EASEMENT

20'

20'

WATER TANK

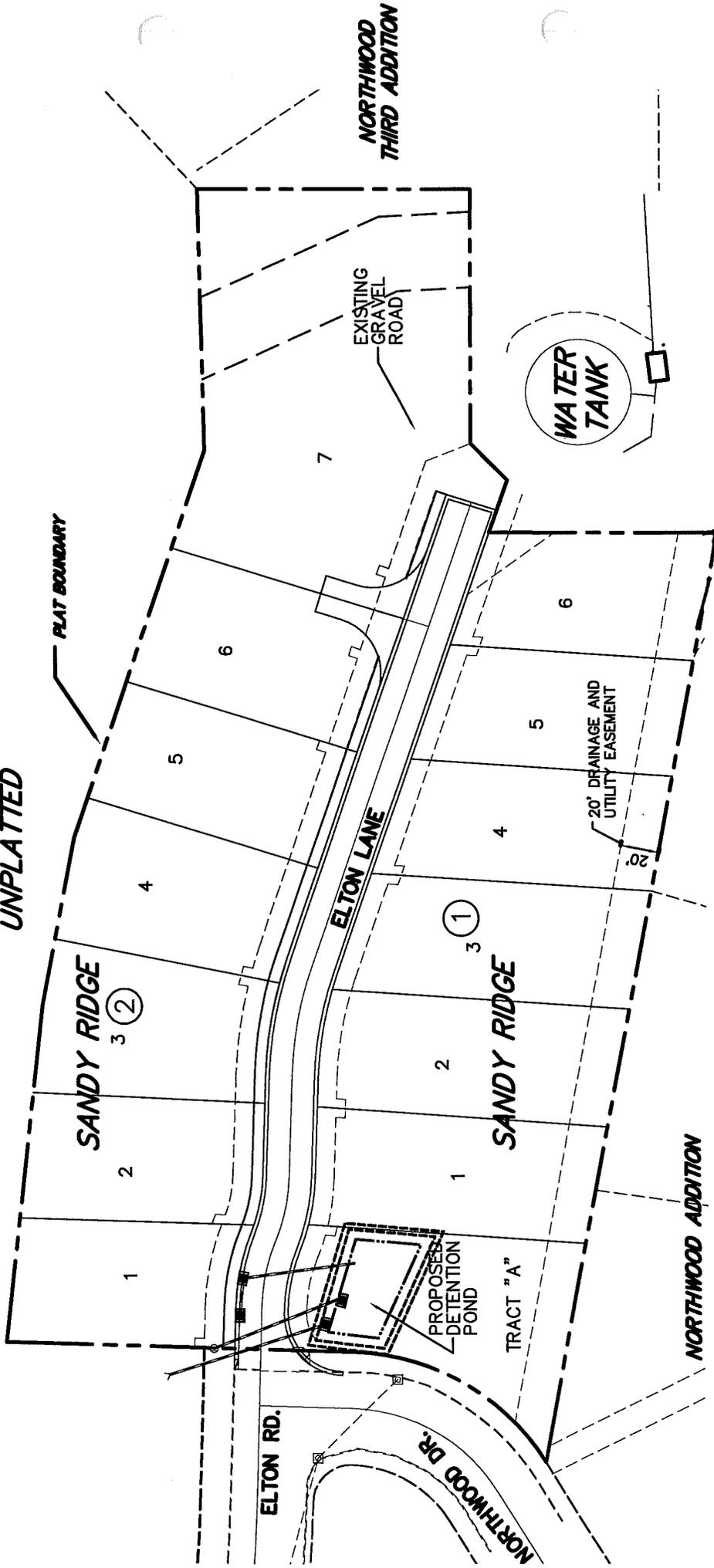
ELTON RD.

NORTHWOOD DR.

PROPOSED DETENTION POND

TRACT "A"

NORTHWOOD ADDITION

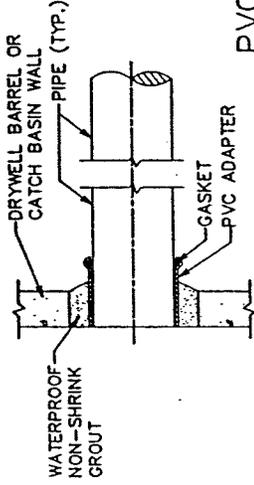


**GENERAL NOTES**

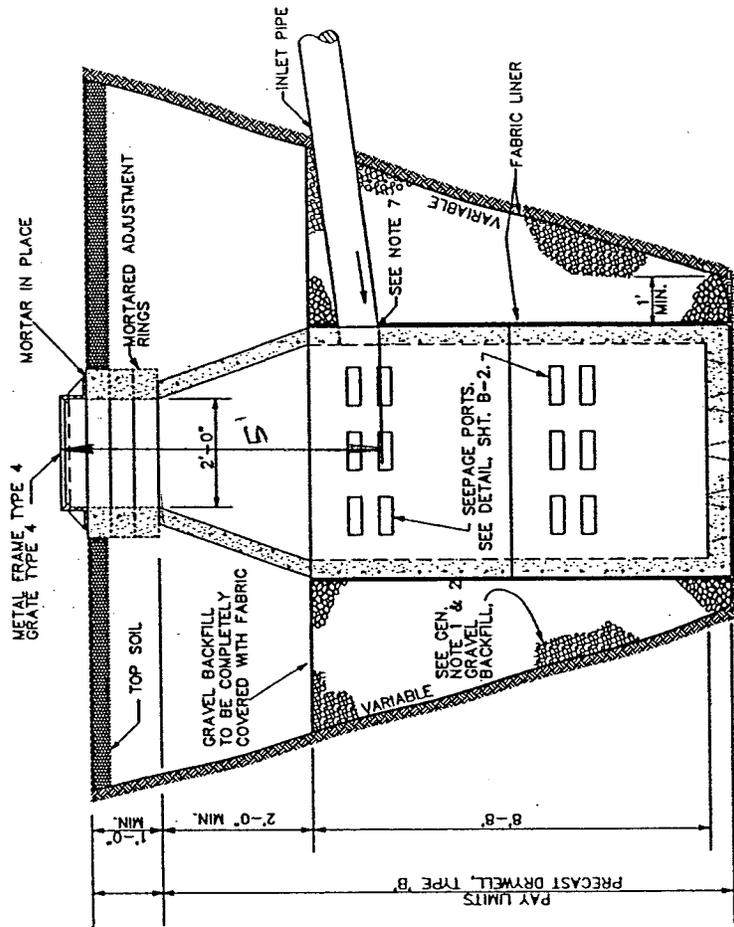
1. GRAVEL BACKFILL QUANTITY FOR DRYWELLS:  
TYPE 'A' - 30 CUBIC YARDS MINIMUM / 42 TONS.  
TYPE 'B' - 40 CUBIC YARDS MINIMUM / 56 TONS.  
OR AS SPECIFIED ON ROAD PLANS.
2. SPECIAL BACKFILL MATERIAL FOR DRYWELLS SHALL CONSIST OF WASHED GRAVEL GRADED FROM 1" TO 3" WITH A MAXIMUM OF 5% PASSING THE U.S. No. 200 SCREEN, AS MEASURED BY WEIGHT. A MAXIMUM OF 10% OF THE AGGREGATE, AS MEASURED BY WEIGHT, MAY BE CRUSHED OR FRACTURED ROCK. THE REMAINING 90% SHALL BE NATURALLY OCCURRING UNFRACTURED MATERIAL.
3. FABRIC SHALL BE MODERATE SURVIVABILITY AS OUTLINED IN STANDARD SPECIFICATIONS 9-33
4. SEE STANDARD PLANS SHEETS B-2 AND B-3 FOR PRECAST CONCRETE DETAILS.
5. ADJUSTMENT BLOCKS SHALL BE CEMENT CONCRETE.
6. PRECAST RISER MAY BE USED IN COMBINATION WITH OR IN LIEU OF ADJUSTING BLOCKS.
7. WHEN PVC PIPE IS USED A PVC ADAPTER SHALL BE INSTALLED.
8. PIPES SHALL BE GROUTED INTO DRYWELLS.

**NOTE:**

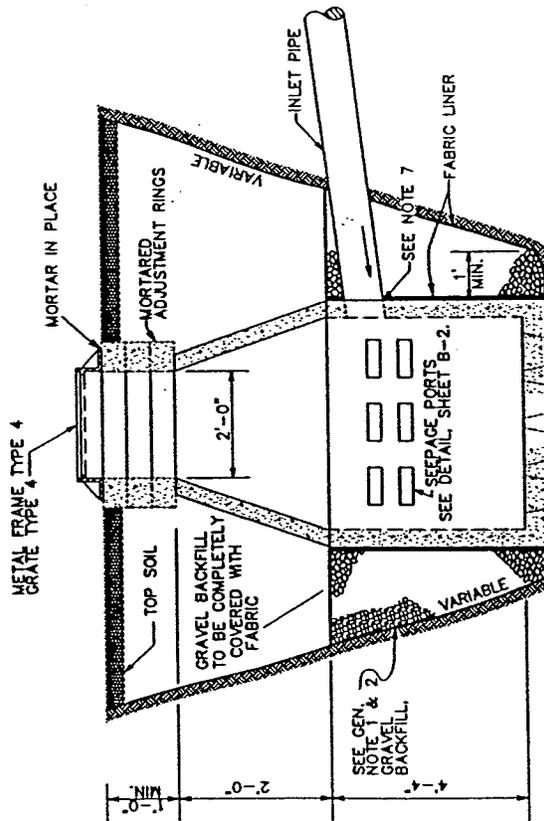
PVC PIPE ADAPTERS AND GASKET MAY VARY IN SHAPE AND SIZE AS ILLUSTRATED IN DETAIL BY ACCEPTABLE ALTERNATE IN ACCORDANCE WITH A.S.T.M.-C-428.



**PVC ADAPTER  
(SAND COLLAR)**



**DRYWELL - TYPE 'B' SWALE**



**DRYWELL - TYPE 'A' SWALE**



APPROVED: *[Signature]*  
COUNTY ENGINEER  
DATE: *[Date]*

SPokane County  
DEPARTMENT OF PUBLIC WORKS  
Spokane, WA 99208 459-3600

STANDARD  
PRECAST DRYWELLS PLACED IN SWALES

NO.	DATE	BY	CHKD.	APPR.	REVISION

STANDARD SHEET B-1a